U.S. NUCLEAR REGULATORY COMMISSION

# STANDARD REVIEW PLAN

OFFICE OF NUCLEAR REACTOR REGULATION

## 3.9.6 INSERVICE TESTING OF PUMPS AND VALVES

### REVIEW RESPONSIBILITIES

Primary - Mechanical Engineering Branch (MEB)

Secondary - None

### I. AREAS OF REVIEW

The MEB reviews the following areas of the applicant's safety analysis report (SAR) that cover the inservice testing of certain safety-related pumps and valves typically designated as Class 1, 2, or 3 under Section III of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (hereinafter "the Code"). Other pumps and valves not categorized as Code Class 1, 2, or 3 may be included if they are considered to be safety related by the staff. Compliance with the Code will assure conformance with 10 CFR Part 50, Appendix A, General Design Criteria 37, 40, 43, 46, 54, and 10 CFR Part 50, §50.55a(g);

1. Inservice Testing of Pumps

   a. The descriptive information in the SAR covering the inservice test program is reviewed for those ASME Code Class 1, 2, and 3 system pumps whose function is required for safety, and in addition includes pumps not categorized as Code Class 1, 2, or 3 but which are considered to be safety related.

   b. Procedures for testing for speed, fluid pressure, flow rate, vibration amplitude, lubricant level or pressure, and bearing temperature at normal pump operating conditions are reviewed.

   c. The pump test schedule is reviewed.

   d. The methods described in the SAR for measuring the reference values and inservice values for the pump parameters above are reviewed.

2. Inservice Testing of Valves

The descriptive information in the SAR covering the inservice test program is reviewed for those ASME Code Class 1, 2, and 3 valves whose function is required for safety. This review does not include those nonsafety-related valves exempted by the Code.

3. Relief Requests

10 CFR Part 50, §50.55a(g) requires a nuclear power facility to periodically update its inservice testing program to meet the requirements of future revisions of Section XI of the ASME Code. However, if it proves impractical to implement these criteria, the applicant is allowed to submit requests for relief from Section XI requirements on a case-by-case basis. Accordingly, any requests for relief are reviewed by the staff to determine if the proposed exceptions to Section XI will degrade the overall plant safety. Due consideration is given to the burden upon the applicant that could result if the criteria of Section XI were imposed on the facility.

II. ACCEPTANCE CRITERIA

The acceptance criteria is based on meeting the relevant requirements set forth in General Design Criteria 37, 40, 43, 46, 54, and 10 CFR Part 50, §50.55a(g). The relevant requirements are as follows:

A. General Design Criterion 37, as it relates to periodic functional testing of the emergency core cooling system to assure the leak tight integrity and performance of its active components.

B. General Design Criterion 40, as it relates to periodic functional testing of the containment heat removal system to assure the leak tight integrity and performance of its active components.

C. General Design Criterion 43, as it relates to periodic functional testing of the containment atmospheric cleanup systems to assure the leak tight integrity and the performance of the active components, such as pumps and valves.

D. General Design Criterion 46, as it relates to periodic functional testing of the cooling water system to assure the leak tight integrity and performance of the active components.

E. General Design Criterion 54 as it relates to piping systems penetrating containment being designed with the capability to test periodically the operability of the isolation and determine valve leakage acceptability.

F. 10 CFR Part 50, §50.55a(g), as it relates to including pumps and valves whose function is required for safety in the Inservice Inspection Program to verify operational readiness by periodic testing.

Specific criteria necessary to meet the relevant requirements of the Commission regulations identified above are as follows:

1. Inservice Testing of Pumps

   a. The scope of the applicant's test program is acceptable if it is in agreement with IWP-1000 of Section XI of the Code and in addition includes pumps not categorized as Code Class 1, 2, or 3, but which are considered to be safety related. Since the pump test program is based on the detection of changes in the hydraulic and mechanical condition of a pump relative to a reference test specified in IWP-3000, the establishment of a reference set of parameters and a consistent test method is a basic criterion of the program.

   b. The pump test program is acceptable if it meets the requirements for establishing reference values and the periodic testing schedule of IWP-3000 of Section XI of the Code. The allowable ranges of inservice test quantities, corrective actions, and bearing temperature tests are established by IWP-3000 and IWP-4000. The pump test schedule in the plant technical specification is required to comply with these rules.

   c. The test frequencies and durations are acceptable if the provisions of IWP-3000 of Section XI of the Code are met.

   d. The methods of measurement are acceptable if the test program meets the requirements of IWP-4000 of Section XI of the Code with regard to instruments, pressure measurements, temperature measurements, rotational speed, vibration measurement, and flow measurements.

2. Inservice Testing of Valves

   a. To be acceptable, the SAR valve test list must contain all safety-related Code Class 1, 2, and 3 valves required by IWV-1100 except those nonsafety-related valves exempted by the Code and in addition includes valves not categorized as Code Class 1, 2, or 3 but which are considered safety related. The SAR valve list must include a valve categorization which complies with the provisions of IWV-2000 of Section XI of the Code. Each specific valve to be tested by the rules of Subsection IWV is listed in the SAR by type, valve identification number, code class, and IWV-2000 valve category.

   b. The valve test procedures are acceptable if the provisions of IWV-3000 of Section XI of the Code are met with regard to preservice and periodic inservice valve testing.

3. Information Required for Review of Relief Requests

   a. Identify component for which relief is requested:

      (1) Name and number as given in FSAR
      (2) Function
      (3) ASME Section III Code Class
      (4) For valve testing, also specify the ASME Section XI valve category as defined in IWV-2000.

   b. Specifically identify the ASME Code requirement that has been determined to be impractical for each component.

c. Provide information to support the determination that the requirement in item (b) is impractical; i.e., state and explain the basis for requesting relief.

d. Specify the inservice testing that will be performed in lieu of the ASME Code Section XI requirements.

e. Provide an explanation as to why the proposed inservice testing will provide an acceptable level of quality and safety and not endanger the public health and safety.

f. Provide the schedule for implementation of the procedure(s) in item (d).

Requests for relief from Section XI requirements will be granted by the staff if the applicant has adequately demonstrated either of the following:

a. Compliance with the code requirements would result in hardships or unusual difficulties without a compensating increase in the level of safety, and noncompliance will provide an acceptable level of quality and safety.

b. Proposed alternatives to the code requirements or portions thereof will provide an acceptable level of quality and safety.

III. REVIEW PROCEDURES

The reviewer will select and emphasize material from the procedures described below as may be appropriate for a particular case. For each area of review, the following review procedures are followed:

1. Inservice Testing of Pumps

a. The scope of the applicant's program is reviewed for agreement with subsection II.1.a. The program is acceptable if a preservice test program is used to establish reference values. The periodic inservice program must verify the reference values within acceptable limits.

b. The pump test program procedures must agree with the requirements of subsection II.1.b. The program is best presented in tabular form.

c. The inservice test frequencies and test durations are reviewed for agreement with subsection II.1.c.

d. The test procedures described in the SAR are reviewed for agreement with subsection II.1.d. The SAR need only provide the necessary information to permit a conclusion that the methods of measurement and the data acquisition system will provide the needed data. The reviewer does not approve or disapprove the instruments or methods proposed or used.

2. Inservice Testing of Valves

a. The SAR valve test list and categorization are reviewed for agreement with Subsection II.2.a.

b. The valve test program is acceptable if the procedures follow the rules of subsection II.2.b for preservice and periodic inservice testing.

3. Relief Requests

Requests for relief from Section XI requirements are reviewed to determine that sufficient information has been provided and that the acceptance criteria of subsection II.3 have been met.

## IV. EVALUATION FINDINGS

The reviewer verifies that sufficient information is provided in accordance with the requirements of this SRP section and that his evaluation supports a conclusion of the following type, to be included in the staff's safety evaluation report:

> The staff concludes that the applicant's pumps and valves test program is acceptable and meets the requirements of 10 CFR Part 50, Appendix A, General Design Criteria 37, 40, 43, 46, 54, and §50.55a(g). This conclusion is based on the applicant having provided a test program to ensure that safety-related pumps and valves will be in a state of operational readiness to perform necessary safety functions throughout the life of the plant. This program includes baseline preservice testing and periodic inservice testing. The program provides for both functional testing of the components in the operating state and for visual inspection for leaks and other signs of distress. Applicant has also formulated his inservice test program to include all safety-related Code Class 1, 2, and 3 pumps and valves and to include those pumps and valves which are not Code Class 1, 2, and 3 but are considered to be safety related.

## V. IMPLEMENTATION

The following is intended to provide guidance to applicants and licensees regarding the NRC staff's plans for using this SRP section. Except in those cases in which the applicant proposes an acceptable alternative method for complying with specified portions of the Commission's regulations, the method described herein will be used by the staff in its evaluation of conformance with Commission regulations.

## VI. REFERENCES


1. 10 CFR Part 50, Appendix A, General Design Criterion 37, "Testing of Emergency Core Cooling System."

2. 10 CFR Part 50, Appendix A, General Design Criterion 40, "Testing of Containment Heat Removal System."

3. 10 CFR Part 50, Appendix A, General Design Criterion 43, "Testing of Containment Atmosphere Cleanup Systems."

4. 10 CFR Part 50, Appendix A, General Design Criterion 46, "Testing of Cooling Water Systems."

5. 10 CFR Part 50, Appendix A, General Design Criterion 54, "Piping Systems Penetrating Containment."

6. ASME Boiler and Pressure Vessel Code, Section III and Section XI, Subsections IWP and IWV, American Society of Mechanical Engineers.

7. Code of Federal Regulations, Title 10, Part 50, Section 50.55a, "Codes and Standards."